

What is claimed is:

- 1                   1.       An apparatus for managing storage access, comprising:  
2                   a disk system, comprising:  
3                         at least one of a plurality of logical device storage units;  
4                         at least one of a plurality of interface ports; and  
5                         a control unit, connected to, and operable to control input and  
6                   output to and from said at least one of a plurality of logical device storage units through  
7                   said at least one of a plurality of interface ports;  
8                         a disk system manager, operative to manage information storage to,  
9                   retrieval from, allocation of, and de-allocation of said at least one of a plurality of logical  
10                  device storage units; and  
11                  a storage access service system, comprising a memory operative to contain  
12                  a plurality of user information, said user information including a time based component,  
13                  said storage access service system operative to grant authorization to access said at least  
14                  one of a plurality of logical device storage units based upon said user information.
- 1                   2.       The apparatus of claim 1, wherein said time based component  
2                   further comprises time zone information, said user information further comprises at least  
3                   one of a plurality of billing rates corresponding to said time zone information, and  
4                   wherein said storage access service system determines charges for user access service  
5                   based upon said time zone information, said at least one of a plurality of billing rates, and  
6                   an access time for said at least one of a plurality of users.
- 1                   3.       The apparatus of claim 2, wherein said user information further  
2                   comprises a history of accesses for said at least one of a plurality of users, and wherein  
3                   storage access service system determines charges for user access service based upon said  
4                   history of accesses for said at least one of a plurality of users.
- 1                   4.       The apparatus of claim 3, wherein said at least one of a plurality of  
2                   billing rates corresponds to selected ones of a plurality of time periods for each of  
3                   individual instances of said time zone information, and wherein said storage access  
4                   service system determines charges for user access service based upon said history of  
5                   accesses for said at least one of a plurality of users by comparing individual instances  
6                   selected from said history of accesses to said selected ones of said plurality of time

7 periods to determine applicable billing rates from among said at least one of a plurality of  
8 billing rates, and thereupon computing a cost of access by summing a cost for each of  
9 said individual instances selected from said history of accesses multiplied by said  
10 applicable billing rates.

1                   5.     The apparatus of claim 4, wherein said at least one of a plurality of  
2 billing rates are determined from a service level agreement (SLA).

1                   6.     The apparatus of claim 2, wherein said at least one of a plurality of  
2 billing rates corresponds to selected ones of a plurality of time periods for each of  
3 individual instances of said time zone information; and wherein said at least one of a  
4 plurality of users agrees to access said at least one of a plurality of logical device storage  
5 units at individual instances of said plurality of time periods in accordance with a preset  
6 schedule, and wherein said storage access service system determines charges for user  
7 access service based upon said at least one of a plurality of billing rates for said plurality  
8 of time periods in said preset schedule for said at least one of a plurality of users.

1                   7.     The apparatus of claim 6, wherein said storage access service  
2 system determines charges for user access service for said at least one of a plurality of  
3 users by comparing individual instances of said plurality of time periods in accordance  
4 with said preset schedule to said selected ones of said plurality of time periods to  
5 determine applicable billing rates from among said at least one of a plurality of billing  
6 rates, and thereupon computing a cost of access by summing a cost for each of said  
7 individual instances of said plurality of time periods in accordance with said preset  
8 schedule multiplied by said applicable billing rate.

1                   8.     The apparatus of claim 7, wherein said at least one of a plurality of  
2 billing rates are determined from a service level agreement (SLA).

1                   9.     The apparatus of claim 6, wherein said storage access service  
2 system determines charges for user access service for said at least one of a plurality of  
3 users by comparing individual instances of said plurality of time periods in accordance  
4 with said preset schedule to said selected ones of said plurality of time periods to  
5 determine applicable billing rates from among said plurality of billing rates, and  
6 thereupon computing a cost of access by multiplying said applicable billing rate by a

7 number of instances of said plurality of time periods in accordance with said preset  
8 schedule in a billing cycle.

1 10. The apparatus of claim 9, wherein said plurality of billing rates are  
2 determined from a service level agreement (SLA).

1 11. A method for managing access to storage resources, comprising:  
2 forming an agreement between access providers and users, said agreement  
3 comprising user information including an identity of a user; an identity of a resource, a  
4 time zone, and at least one of a plurality of billing rates for accessing said resource;  
5 granting access to said resource based upon said identity of said user, said  
6 identity of said resource, and said time zone; and  
7 determining charges for accessing said resource based upon said identity  
8 of said user, said identity of said resource, and said at least one of a plurality of billing  
9 rates.

1 12. The method of claim 11, further comprising:  
2 logging individual instances of access to said resource into a history of  
3 accesses.

1 13. The method of claim 12, wherein determining charges for a user  
2 based upon individual instances of access by said user of said resource, said time zone,  
3 and said at least one of a plurality of billing rates comprises:  
4 determining a usage time for each individual instance of access selected  
5 from said history of accesses;  
6 determining a billing rate corresponding to said usage time from among  
7 said at least one of a plurality of billing rates; and  
8 computing a cost by summing a cost for each individual instance of access  
9 selected from said history of accesses, said cost computed by multiplying said usage time  
10 by said billing rate corresponding to said usage time.

1 14. The method of claim 13, wherein said at least one of a plurality of  
2 billing rates corresponds to at least one of a plurality of time periods for said time zone,  
3 and wherein determining a billing rate corresponding to said usage time from among said  
4 at least one of a plurality of billing rates comprises:

5 comparing said individual instances of accesses logged into said history of  
6 accesses to said plurality of time periods to select a billing rate corresponding to said  
7 usage time from among said plurality of billing rates.

1 15. The method of claim 11, wherein said user agrees to access said  
2 resource at a time period in accordance with a preset schedule; and wherein said granting  
3 access to said resource based upon said identity of said user, said identity of said  
4 resource, and said time zone comprises:

5 granting said user access to said resource within said time period in  
6 accordance with said preset schedule.

1 16. The method of claim 15, wherein said at least one of a plurality of  
2 billing rates for accessing said resource corresponds to at least one of a plurality of time  
3 periods for said time zone, and wherein determining charges for accessing said resource  
4 based upon said identity of said user, said identity of said resource, said at least one of a  
5 plurality of billing rates, and said time period comprises:

6 selecting from among said plurality of billing rates a billing rate  
7 corresponding to said time period in accordance with said preset schedule; and  
8 computing a cost of access by summing a cost for each individual instance  
9 of said time period in accordance with said preset schedule multiplied by said billing rate  
10 corresponding to said time period in accordance with said preset schedule.

1 17. The method of claim 15, wherein said at least one of a plurality of  
2 billing rates for accessing said resource corresponds to at least one of a plurality of time  
3 periods for said time zone, and wherein determining charges for accessing said resource  
4 based upon said identity of said user, said identity of said resource, said at least one of a  
5 plurality of billing rates, and said time period comprises:

6 selecting from among said plurality of billing rates a billing rate  
7 corresponding to said time period in accordance with said preset schedule; and  
8 computing a cost of access by multiplying said billing rate corresponding  
9 to said time period by a number of instances of said time period occurring in a billing  
10 cycle in said preset schedule.

1 18. A method for charging users for storage access in a disk subsystem,  
2 said method comprising:

3 determining based upon a time zone of a location of a user at least one of a  
4 plurality of permitted access times, and at least one of a plurality of access rates, said  
5 access rates corresponding to said permitted access times;

6 contracting with said user to provide storage access based upon a capacity,  
7 said at least one of a plurality of permitted access times, and said at least one of a  
8 plurality of access rates, said access rates corresponding to said permitted access times;

9 tracking time periods when said user accesses storage in said disk system;

10 determining for said time periods charges to said user for access, said  
11 charge based upon said time zone of a location of said user, said at least one of a plurality  
12 of permitted access times, and said at least one of a plurality of access rates; and

13 determining a total cost from said charges to said users for access.

1 19. A method for charging users for storage access in a disk subsystem,  
2 said method comprising:

3 determining based upon a time zone of a location of a user at least one of a  
4 plurality of permitted access times, and at least one of a plurality of access rates, said  
5 access rates corresponding to said permitted access times;

6 contracting with said user to provide storage access based upon a capacity,  
7 said at least one of a plurality of permitted access times, and said at least one of a  
8 plurality of access rates, said access rates corresponding to said permitted access times;

9 determining for said permitted access times, charges to said user for  
10 access, said charge based upon said time zone of a location of said user, said at least one  
11 of a plurality of permitted access times, and said at least one of a plurality of access rates;  
12 and

13 determining a total cost from said charges to said users for access.

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